

# PATENT ABSTRACTS OF JAPAN

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(54) METHOD FOR USING SURFACTANT/SOLVENT COMBINATION FOR IMPROVING  
PRINT QUALITY OF IMAGE OF INK-JET INK

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an ink-jet ink having improved  
properties concerning to color quality such as speckscoalescence  
(coagulation) and saturation.

SOLUTION: The ink-jet ink comprises a dyean 8-18C first surfactant and a  
6-10C second surfactantwherein the second surfactant is soluble in water  
at a rate of  $\geq 3$  wt.%. The ink provides an excellent ink-jet print having  
excellent color and performance properties. Each of those aqueous inks  
comprises colorants (CMYK i.e. cyanmagentayellowblack)the long chain  
first surfactant and the short chain second surfactant.

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## CLAIMS

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[Claim(s)]

[Claim 1]

Ink jet ink which is ink jet inkand contains colorantthe first surface-

active agent containing 8-18 carbon and the second surface-active agent containing 6-10 carbon and dissolves said second surface-active agent in 3wt% water at least.

[Claim 2]

The ink jet ink according to claim 1 in which said ink contains said 0.1 - 20wt% of colorant said 0.2 - 6wt% of first surface-active agent and said 5 - 15wt% of second surface-active agent.

[Claim 3]

The ink jet ink according to claim 1 in which said ink contains 0% [ which was chosen from a group which comprises a buffer a biocide a metal chelate-ized agent and other non-surface-active agent solvents further ] - 3wt% of an ingredient.

[Claim 4]

The ink jet ink according to claim 2 in which said colorant is paints.

[Claim 5]

The ink jet ink according to claim 2 in which said colorant is a color.

[Claim 6]

The ink jet ink according to claim 1 chosen from a group to which said second surface-active agent changes from 12-hexandiol 22-diethyl- 13-propanediol 2-methyl-2-propyl-13-propanediol and those mixtures.

[Claim 7]

Ink jet ink which is ink jet ink and contains anionic colorant 0.2 containing 8-18 carbon - 6wt% of the first anionic surfactant and the second anionic surfactant containing 6-10 carbon and said second surface-active agent dissolves in 3wt% water at least.

[Claim 8]

Said ink Said 0.1 - 20wt% of anionic colorant said 5 - 15wt% of second surface-active agent And the ink jet ink containing 0% [ which was chosen from a group which comprises a buffer a biocide a metal chelate-ized agent and other non-surface-active agent solvents ] - 3wt% of an ingredient according to claim 7.

[Claim 9]

Ink jet ink which is ink jet ink and contains cationic colorant the first surface-active agent containing 8-18 carbon and the second surface-active agent containing 6-10 carbon and dissolves said second surface-active agent in 3wt% water at least.

[Claim 10]

Said ink Said 0.1 - 10wt% of cationic colorant said 0.2 - 6wt% of first surface-active agent The ink jet ink containing 0% [ which was chosen from a group which comprises said 5 - 15wt% of second surface-active agent and a buffer a biocide a metal chelate-ized agent and other non-

surface-active agent solvents ] - 3wt% of an ingredient according to claim 9.

[Claim 11]

Are the improved print characteristic a printing method in a shown ink jet ink printer and said ink A method by which what contains colorant the first surface-active agent containing 8-18 carbon and the second surface-active agent containing 6-10 carbon and said second surface-active agent dissolves in 3wt% water at least is chosen.

[Claim 12]

Said ink Said 0.1 - 20wt% of colorant said 0.2 - 6wt% of first surface-active agent A method containing 0% [ which was chosen from a group which comprises said 5 - 15wt% of second surface-active agent and a buffer a biocide a metal chelate-sized agent and other non-surface-active agent solvents ] - 3wt% of an ingredient according to claim 11.

[Claim 13]

A method according to claim 11 chosen from a group to which said second surface-active agent changes from 12-hexandiol 22-diethyl- 13-propanediol 2-methyl-2-propyl-13-propanediol and those mixtures.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[Field of the Invention]

[0001]

This invention relates to the specific ink formulation for a color and a performance attribute in detail generally concerning ink jet printing. This ink formulation brings about an improvement of ink jet printing quality again.

[Background of the Invention]

[0002]

Ink jet printing is nonimpact presswork which makes an ink drop deposit in a specific order on a printing medium and forms an alphanumeric character field restoration and other patterns on it. The high quality of low cost and a hard copy output was conjointly used together with the computer in the ink-jet printer with operation which does not have noise comparatively and also it was made [ which is replaced with the printer of a system ] popular. In order to improve the quality of ink jet printing in spite of those latest success intensive research and development effort are continued. The rapid rise of concern in the field of ink jet printing especially a photoprint serves as the request of

liking to make a quality print at appropriate cost. The challenge is continued in order to improve the printing quality of ink jet printing further. The picture of the high resolution which the appearance of use of the ink jet printing as an object for digital photographs has an exact color and is durable and does not show band-like-ization of a color is required.

[0003]

Black is typically used for a color ink jet printer like an available DesignJet (registered trademark) printer from Hewlett Packard by three sorts of ink of a different color tone, i.e. magenta, yellow, cyan, and option. The characteristic set of the colorant (for example color) used for ink production is called "a primary color set (primary dye set)." The spectrum of a color, for example secondary color, can be made using various combination of a primary color set.

[0004]

Generally the good ink set for color ink jet printing must suit with an ink jet pen and a printing system. A spot coalescence (coagulation) and a color attribute like saturation are included in some various characteristics required of ink jet ink.

[0005]

A "spot" and "coalescence" are defined as the disagreement (or disharmony) of the print density about the same printing blocks resulting from the interaction of a typographical defect and a medium and a solvent/ink. Good color saturation is attained by making the depth and light and darkness of a color into the maximum and this is also influenced by the interaction of ink/medium.

[Description of the Invention]

[Problem to be solved by the invention]

[0006]

The ink which has one of the above-mentioned character or two or more is known. However, since improvement of the one characteristic makes another characteristic often deteriorate, most ink provided with all the aforementioned characteristics is not known. Therefore, much ink with which business is presented is a product of compromise of the trial which makes profitably like the ink in which a response suitable at least about each of the aforementioned consideration is shown clearly. So for the time being, without sacrificing the performance and reliability of a pen, the complexity of a printer and a software design is reduced in a field and the demand which improves the printing quality and reliability of ink jet printing further exists in it.

[Means for solving problem]

[0007]

The ink which was suitable for using it for ink jet ink by this invention and its preparing method are provided. It is found out that coalescence, a spot and the synergistic effect that results in the clear improvement of saturation are caused by the combination of the second or a co-surfactant defined as the compound containing a certain kind of colorant, a surface-active agent and about 6 that melts into 3wt% water at least thru/or about ten carbon. This combination provides the base of the ink formulation which brings about a good color and a performance attribute.

[0008]

By finding out the relation between selections of a surface-active agent, the breadth of a far large formulation is given to a future product. The synergistic effect which surprisingly exists between the selected surface-active agents results in the very stable formulation which gives a preparation person a remarkable expansion of selection of a surface-active agent suitable for use and a solvent. The combination of a surface-active agent and the second surface-active agent can consider that the solubility of the ink component to the inside of the micell formed by use of these surface-active agents is raised without furthermore being restricted to theory. This is made to result in the further reduction of color saturation deeper than the case of only one of ingredients, a spot and coalescence. This formulation usually acts appropriately also to which of a paper medium and a special order medium.

[0009]

When carrying out this invention, the aqueous ink of yellow, cyan, magenta and black. In the formulation of ink, respectively About 0.1 - about 20 wt(s)% of at least one colorant, About 5 which melts into 3wt% water at least including about 6 thru/or about ten carbon - about 15 wt(s)% of at least one line, The letter of branching, the aromatic short chain, second or a co-surfactant and about 8 thru/or about 18 carbon. The first surface-active agent of about 0.2 which contains about 11 thru/or about 18 carbon preferably - about 6 wt(s)% of at least one line, the letter of branching or the non-ion that does not branch, negative ion, a positive ion or the zwitter ion is contained. Which electric charge may a co-surfactant be? In addition, the ingredient of others containing what was chosen from the group which comprises a buffer, a biocide and a metal chelate-ized agent independently of others, and the water of balance quantity may be added. Of course, the person skilled in the art of the field of an ink formulation will optimize ink by configuring the electric charge of various ingredients of the last formulation.

[Effect of the Invention]

[0010]

The ink which was suitable for using it for ink jet ink by this invention and its preparing method are provided. Especially this invention with the combination of the second or a co-surfactant defined as the compound containing colorant, a surface-active agent and about 6 that melts into 3wt% water at least thru/or about ten carbon. Providing the ink jet ink which produces coalescence, a spot and the synergistic effect that results in the clear improvement of saturation and the printing method using this provides the base of the ink formulation which brings about a good color and a performance attribute.

[0011]

And without sacrificing the performance and reliability of a pen, this ink formulation reduces the complexity of a printer and a software design and improves the printing quality and reliability of ink jet printing further.

[Best Mode of Carrying Out the Invention]

[0012]

Although this Description is concluded by the Claims which point out especially the thing considered to be this invention and carry out a range claim clearly, the advantage of this invention can be checked therefore still more easily by description of the following this inventions.

[0013]

All the concentration in this Description is the mass percents (wt%) in all the ink compositions as long as it points separately and there is nothing. The purity of all the ingredients is purity with which the usual business is presented as ink jet ink.

Colorant

Yellow, cyan, magenta and the aqueous ink of black contain about 0.1 - about 20 wt(s)% of at least one colorant when carrying out this invention respectively. When used here, a desirable quantity of a positive ion color is about 1 - about 20 wt(s)% of at least one black colorant in about 0.1 - about 10 wt(s)% of paints and a black ink formulation about 0.1 - about 10 wt(s)%. Black ink may be three sorts of primary colors: yellow, cyan and a compound of magenta again.

A color-color is employable in enforcement of this invention if it is water solubility and will be water-insoluble nature. As an example of water soluble dye, a sulfonate and a carboxylate color and the thing usually especially used for ink jet printing are contained. As a specific example, it is Aldrich altogether. From a chemical

company[ available ] Sulforhodamine B (sulfonate) Acid Blue 113 (sulfonate) Acid Blue 29 (sulfonate) Acid Red 4 (sulfonate) Rose Bengal (carboxylate) Acid Yellow 17 (sulfonate) Acid Yellow 29 (sulfonate) Acid Yellow 42 (sulfonate) Acridine Yellow G (sulfonate) and Nitro Blue Tetrazolium Chloride Monohydrate, i.e. Nitro BT. Rhodamine 6G the rhodamine 123 rhodamine Ba rhodamine B isocyanate Safranin O Azure B Azure B Eosinate Basic Blue 47 Basic Blue 66 Thioflavin T (Basic Yellow 1) and auramine O (Basic Yellow 2) are contained. The example of a water-insoluble nature color includes azo xanthene methine poly methine and an ANTORO quinone color. As a specific example of paints it is Ciba-Geigy, Orasol Blue GNCiba-Geigy Orasol Pink and Ciba-Geigy Orasol Yellow is contained. It can be used with the preparation ingredient of others of this invention and each color which is compatibility may be used as colorant. Vehicle

The ink of this invention contains the aqueous vehicle which comprises the following ingredient by wt% of total ink presentations. About 5 - about 15 wt(s)% of the aqueous vehicle which comprises about 7 - about 11 wt(s)% of second at least one surface-active agent preferably, the surface-active agent in this invention -- about 0.2 - about 6 wt(s)% of ink formulations -- it exists in about 0.5 - about 3 wt(s)% of quantity preferably. A more desirable surface-active agent has about 8 - carbon of 18 abbreviation for the limit of solubility. Desirable surface-active agents are an ethylene oxide surface-active agent and an ethylene oxide surface-active agent which has the carbon number 8 [ about ] - about 18 hydrocarbon group more preferably. Other ingredients selected independently of the group which comprises a buffer a biocide and a metal chelate-ized agent may be added in the quantity of the range (0 - about 3 wt(s)%) up to 3 wt% respectively and the water of balance quantity may be added.

Buffer: The ink of this invention contains 0 - about 3 wt(s)% of a buffer arbitrarily. The ink concerned has about 0.1 - about 0.3 wt(s)% of the most preferred concentration more preferably including about 0.1 - about 0.5 wt(s)% of a buffer.

[0014]

The buffer used when carrying out this invention for pH regulation may be an organic system living thing buffer or an inorganic buffer and is an organic system preferably, setting the buffer furthermore adopted to enforcement of this invention -- about 3 - about 9 -- desirable -- about 6.5 - about 8.5 -- and pH of about 7.2 to 8.5 range must be maintained most preferably. In the example of the buffer used preferably it is Aldrich, Trizma Base available from a company like a chemical company

(MilwaukeeWisconsin)4-morpholine ethane sulfonic acid (MES)4-hydroxy-4-morpholine propanesulfonic acid (MOPSO)and 4-morpholine propanesulfonic acid (MOPS) are contained. TRIZMA is most preferably adopted as enforcement of this invention.

Metal-chelate-ized agent: The ink of this invention contains 0 - about 3 wt(s)% of a metal chelate-ized agent arbitrarily. The ink concerned has about 0.1 - about 0.3 wt(s)% of the most preferred concentration more preferably including about 0.1 - about 0.5 wt(s)% of a metal chelate-ized agent.

[0015]

The metal chelate-ized agent used when carrying out this invention is used for combining the metallic cation which may exist in ink. For the example of the metal chelate-ized agent used preferably.

Ethylenediaminetetraacetic acid (EDTA)diethylenetriamine pentaacetic acid (DTPA)The chelating agent of others which can combine a transformer 12-diaminocyclohexane tetraacetic acid (CDTA)diethylene (ethylene dioxy) dinitrilo tetraacetic acid (EGTA)or a metallic cation is contained. more -- desirable -- EDTA and DTPA -- and EDTA of the form of a disodium salt is most preferably used when carrying out this invention. Biocide: The ink of this invention contains 0 - about 3 wt(s)% of a biocide arbitrarily. The ink concerned has about 0.1 - about 0.3 wt(s)% of the most preferred concentration more preferably including about 0.1 - about 0.5 wt(s)% of a biocide.

[0016]

Each may use the biocide usually used for ink jet ink when carrying out this invention. Proxel GXL available [ to them /for example ] from available Nuosept 95 and Zeneka Co. (WilmingtonDelaware) from the Huels United States (PiscatawayNew Jersey)And the glutaraldehyde which attaches trademark Ucarcide 250 and is marketed from Union Carbide (Bound BrookNew Jersey) is contained. Proxel GXL is a desirable biocide.

[0017]

It is expected that the specific ink set indicated here will find out a commercial use in ink jet color printing.

[Working example]

[0018]

the advantage which prepares ink and is attained in enforcement of this invention --- that isThe various characteristics of the ink prepared in order to evaluate the spot and coalescence which are the disagreement (or disharmony) of the print density about the same printing blocks resulting from the interaction of typographical disharmonyand a solvent/ink with a medium were measured wholeheartedly. Good color



saturation is attained by making the depth and light and darkness of a color into the maximum and this is also influenced by the interaction of ink/medium.

[0019]

[Table 1]

[0020]

Embodiment 1-1 to 1-10 contains the co-surfactant of this invention and shows the outstanding saturation.

[0021]

Embodiment 1-11 to 1-14 does not contain the specific combination indicated here but shows a comparatively inferior result.